U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 222.

Experiment Station Work, XXVIII.

Compiled from the Publications of the Agricultural Experiment Stations.

PREPARED IN THE OFFICE OF EXPERIMENT STATIONS.

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WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1905.

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EXPERIMENT STATION WORK.

Edited by W. H. Beal and the Staff of the Experiment Station Record.

Experiment Station Work is a subseries of brief popular bulletins compiled from the published reports of the agricultural experiment stations and kindred institutions in this and other countries. The chief object of these publications is to disseminate throughout the country information regarding experiments at the different experiment stations, and thus to acquaint farmers in a general way with the progress of agricultural investigation on its practical side. The results herein reported should for the most part be regarded as tentative and suggestive rather than conclusive. Further experiments may modify them, and experience alone can show how far they will be useful in actual practice. The work of the stations must not be depended upon to produce "rules for farming." How to apply the results of experiments to his own conditions will ever remain the problem of the individual farmer.—A. C. True, Director, Office of Experiment Stations.

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ILLUSTRATION.

EXPERIMENT STATION WORK.[a]

HOME MIXING OF FERTILIZERS.[b]

The economy of home mixing has been studied by a number of the experiment stations, as shown in previous numbers of this series.[c] C. D. Woods, director of the Maine Station has recently reported further studies of the subject which yielded results of practical importance.

To make it evident that Maine farmers do and can mix goods that are in all particulars equal to the best factory mixed, the station made in 1904 cooperative experiments upon home mixing with farmers in Brunswick, Houlton, and Fort Fairfield (Maple Grove). * * * A number of farmers at Brunswick clubbed together and purchased bone tankage, cotton-seed meal, nitrate of soda, acid phosphate, and sulphate of potash. The tankage was not in as good mechanical condition as was desirable, but this was remedied by passing it over a screen with 3 meshes to the inch, and rejecting all that did not go through. The coarser particles were not wasted, but were used around fruit trees, etc., where the nitrogen and phosphoric acid would slowly become available and be utilized.

After all of the goods had been screened, samples were taken for analysis. The materials were then weighed and spread out in layers, one above the other, on the barn floor, care being taken to put the bulkiest materials at the bottom. They were then mixed by shoveling together four times and bagged.

The composition of the mixed fertilizer agreed within the limits of error of chemical analysis with that calculated from the composition of the original unmixed materials, thus showing very perfect mixing.

Chemical analyses of a mixture prepared from unscreened goods, assuming shippers' weights to be correct, showed that while there was not as close agreement between calculated and actual composition as in case of the more carefully screened, weighed, and sampled goods, it ran "as close as many of the ready mixed goods sold in the State do to their guaranties. The mechanical condition of these goods was excellent. They were used in the potato planter, and even

[a] A progress record of experimental inquiries, published without assumption of responsibility by the Department for the correctness of the facts and conclusions reported by the stations.

[b] Compiled from Maine Sta. Bul. 107.

[c] U. S. Dept. Agr., Farmers' Buls. 65, 84.

in the old-type Robbin's planter the fertilizer was distributed as freely and evenly as could be asked. The cotton-seed meal and tankage were so dry that the use of a filler was unnecessary. About 40 acres of potatoes were grown with the above home-mixed goods, the fields being situated in three towns and two counties. * * * In general large crops, ranging in Aroostook County from 275 to 380 bushels per acre, were obtained. On early planted potatoes, and where the season was long enough for the crop grown on the home mixture to mature, the yields were as large as where the standard commercial fertilizers were liberally used."

The mixture used per acre in 1904 was:

	Pounds.
Tankage	500
Cotton-seed meal	200
Nitrate of soda	100
Acid phosphate	400
Sulphate of potash	200
Total	1,400

This mixture contained 4 per cent of nitrogen, 7.5 per cent of available phosphoric acid, 11.3 per cent total phosphoric acid, and 7.3 per cent of potash, and furnished 56.1 pounds of nitrogen per acre, 104.7 pounds of available and 158.4 pounds of total phosphoric acid, and 102.6 pounds of potash per acre. As stated, the mixture gave good results when the season was long enough to mature the crop. For quick maturing it apparently carried too much slowly available nitrogen and too little available phosphoric acid.

A mixture for potatoes containing an excess of phosphoric acid which will tend to early maturity is suggested, as follows:

	Pounds.
Nitrate of soda [a]	200
Screened tankage	200
High grade dried blood [b]	100
Acid phosphate	500
Sulphate of potash	200
Total	1,200

This contains 4.7 per cent nitrogen, 6.7 per cent available phosphoric acid, 8.5 per cent total phosphoric acid, and 8.3 per cent potash, and furnishes 56 pounds of nitrogen per acre, 80 pounds of available and 102 pounds of total phosphoric acid, and 100 pounds of potash per acre.

[a] Or sulphate of ammonia, 75 pounds.

[b] Or dried blood 150 pounds, or cotton-seed meal 200 pounds.

A suggested mixture for potatoes to be used on sod land where a good stubble and aftermath has been plowed under, or in connection with farm manures, is as follows:

	Pounds.
Nitrate of soda	100
Screened tankage	200
Acid phosphate	300
Sulphate of potash	200
Total	800

This mixture contains 3.4 per cent nitrogen, 6.8 per cent available phosphoric acid, 9.2 per cent total phosphoric acid, and 12.5 per cent potash, and furnishes 27 pounds of nitrogen, 54 pounds of available and 74 pounds of total phosphoric acid, and 100 pounds of potash per acre.

These mixtures are intended to supply sufficient fertilizing material for a crop of 300 bushels. "It is to be borne in mind in using these formulas that they are only suggestive and that different conditions of soil make such different treatment essential that a formula which may prove successful on one farm may not be equally so on another." In no case is it to be expected that fertilizers will take the place of good tillage and care of crops.

With these reservations in mind the above formulas for fertilizer mixtures for potatoes and those for various crops which follow may be suggestive and helpful to those who contemplate engaging in the home mixing of fertilizers:

Formulas for fertilizers for various crops suggested by the Maine Experiment Station.

Crop and fertilizing materials.	Weight used.	Nitrogen.	Phosphoric acid.		Potash.
			Available.	Total.	
CORN on sod land or in conjunction with farm manure:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Nitrate of soda	100	16			
Acid phosphate	400		52	64	
Muriate of potash	150				75
Total	650	16	52	64	75
Percentage composition		2.5	8.0	9.9	11.5
Nitrate of soda	100	16			
Screened tankage	200	11	15	32	
Acid phosphate	300		39	42	
Muriate of potash	150				75
Total	750	27	54	74	75
Percentage composition		3.7	7.2	9.9	10.0
Nitrate of soda	100	16			
Cotton-seed meal	200	14		3	4
Acid phosphate	400		52	64	
Muriate of potash	150				75
Total	850	30	52	67	79
Percentage composition		3.5	6.1	7.9	9.3

Formulas for fertilizers for various crops, etc.—Continued.

Crop and fertilizing materials.	Weight used.	Nitrogen.	Phosphoric acid.		Potash.
			Available.	Total.	
GRASS—spring seeding with oats as a nurse crop in conjunction with liberal applications of farm manure:[a]	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Nitrate of soda	100	16			
Acid phosphate	400		52	56	
Muriate of potash	250				125
Total	750	16	52	56	125
Percentage composition		2.1	6.9	7.5	16.5
GRASS—spring seeding with oats without farm manure:					
Nitrate of soda	100	16			
Screened tankage	500	28	36	80	
Acid phosphate	200		26	28	
Muriate of potash	250				125
Total	1,050	44	62	108	125
Percentage composition		4.2	5.9	10.3	11.9
GRASS—summer or fall seeding with farm manure (at seeding):					
Acid phosphate	100		13	14	
Muriate	170				38
Total	270		13	14	38
Percentage composition			6.5	7.0	19.0
The following spring apply—					
Nitrate of soda	100	16			
Acid phosphate	200		26	28	
Muriate	250				100
Total	450	16	26	28	100
Percentage composition		3.6	5.8	6.2	22.2
GRASS—summer or fall seeding without farm manure (at seeding):					
Nitrate of soda	100	16			
Screened tankage	400	22	29	64	
Muriate of potash	100				50
Total	600	38	29	64	50
Percentage composition		6.3	4.8	10.7	8.3
The following spring apply—					
Nitrate of soda	100	16			
Acid phosphate	200		26	28	
Muriate	250				100
Total	450	16	26	28	100
Percentage composition		3.6	5.8	6.2	22.2
GRASS—spring top-dressing grass land, suggested by the Rhode Island Experiment Station:[b]					
Nitrate of soda	350	54			
Acid phosphate	400		52	56	
Muriate of potash	250				125
Total	1,000	54	52	56	125
Percentage composition		6.8	6.5	7.0	15.6
CLOVERS, OR ALFALFA, without other manure and on land carrying the proper root tubercle organisms:					
Nitrate of soda	50	8			
Acid phosphate	400		52	56	
Muriate of potash	250				125
Total	700	8	52	56	125
Percentage composition		1.1	7.4	8.0	17.9

[a] If desired to apply by machinery, it would be necessary to mix with about 200 pounds of some fine, dry material, as muck or loam.

[b] Rhode Island Sta. Bul. 90.

Formulas for fertilizers for various crops, etc.—Continued.

Crop and fertilizing materials.	Weight used.	Nitrogen.	Phosphoric acid.		Potash.
			Available.	Total.	
BEANS OR PEAS without the manure on soil carrying the proper root tubercle organisms:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Nitrate of soda	50	8			
Acid phosphate	400		52	56	
Muriate of potash	150				75
Total	600	8	52	56	75
Percentage composition		1.3	8.7	9.3	12.5
MANGOLDS OR OTHER BEETS, based upon experiments at the Rothamsted (England) Experiment Station (to be used in conjunction with a liberal dressing of farm manure):					
Nitrate of soda	400	64			
Muriate of potash	400				200
Common salt [a]	200				
Total	1,000	64			200
Percentage composition		6.4			20.0
MANGOLDS OR OTHER BEETS without farm manure:					
Nitrate of soda	200	32			
Screened tankage	800	44	58	128	
Sulphate of ammonia (or 300 pounds high-grade dried blood)	200	40			
Acid phosphate	200		26	28	
Muriate of potash	400				200
Common salt	200				
Total	2,000	116	84	156	200
Percentage composition		5.8	4.2	7.8	10.0

[a] Beets are successfully grown in Maine without salt.

It is of the utmost importance in purchasing materials for these home mixtures to buy only on a guaranty of composition and to insist that the materials shall be of standard high-grade quality.

GROWING SWEET-CORN SEED IN THE SOUTH.

There is a popular belief that sweet-corn seed can not be grown year after year in the South without deterioration in quality. Some light has been thrown on this subject recently by the investigations of the Maryland Station.[a] That station has found that in a State as far south as Maryland at least as good or better sweet-corn seed can be and is grown for use within the State as can be grown in New England. The yield obtained in Maryland from Maryland-grown seed is considerably higher than the yield obtained when Connecticut seed is used. "Not only is the yield higher, but repeated observation has shown that the quality of the crop was as good, if not better, and that the plants from home-grown seed stood the climatic changes much better than those from northern-grown seed."

In support of the above claims it is stated that the Stabler family has originated and grown in Maryland three distinct varieties of

[a] Compiled from Maryland Sta. Bul. 96.

sweet corn, all of which are recognized as of the highest quality. No seed from the North has been used on the Stabler farm for the past twenty-six years. A Mr. S. N. Hyde, of Baltimore, states that since 1878 he has been growing his own sweet-corn seed for his canning business and for twenty-five years put up a pack from Maryland-grown seed of Egyptian sweet corn that brought the highest price of any canned corn on the American market. In Harford County a Mr. Charles W. Baker in 1904 grew a crop of 500 acres of sweet corn for canning purposes. The variety grown was a strain of Evergreen obtained originally from Connecticut. Mr. Baker grows his own seed and has not changed seed for twenty-five years. In the vicinity of Aberdeen, Md., nearly 7,000 acres of sweet corn was grown in 1904, nearly all from Maryland seed. People in that section have found from experience that if they do not save their own seed they can not expect a good stand of corn.

These facts indicate that good sweet-corn seed can be grown in Maryland, that the seed does not "run out," and that the development of useful varieties of sweet corn depends more perhaps upon men and methods than upon climate. "The experience at Aberdeen shows that there is no inherent tendency to deteriorate if the variety be kept pure and be grown under ordinary favorable conditions."

One of the difficulties in the way of developing and keeping pure a variety of sweet corn is the ease with which it mixes with other varieties and with field corn.

> Sweet corn and field or hard corn, if planted at the same time, will mix at least a quarter of a mile away, and thus the sweet corn be much injured in quality. Adams Early, which is not sweet corn, will ruin sweet corn blossoming near it at the same time. * * * But the writer has found little difficulty in avoiding the mixing by always planting sweet corn intended for seed a little earlier than any field corn is planted on his or adjoining farms.

The method of selecting seed sweet corn by the different Maryland growers varies. One way which has been found satisfactory is thus stated:

> For many years it has been the custom to select for home planting a small number of ears having the characteristics most desired. Earliness is maintained only by saving the earliest ears from the early corn, and from these earliest ears a small number, known as "double extra," are set aside for the breeding plat. In selecting these double extra ears attention is not only paid to size, length of grain, and length of cob, but to the character of the corn for quality, as denoted by its translucent appearance. Effort is made to practice rigid selection, i. e., not only to have a great many of the right kind of ears, but to plant none of the wrong kind in the breeding plat or near it.

One of the most vital factors in the sweet-corn seed industry is the proper curing of the ears. Sweet corn molds and ferments more easily than field corn. This greatly injures germination. Freezing

before curing also injures germination. Some of the difficulties in curing sweet corn are thus pointed out:

Fire heat used to dry the corn has not proved satisfactory, because it will cause the cob to sour long before it has had time to dry out. Corn thrown in a large pile with or without the husk on will develop heat enough inside of twenty-four hours to injure the germ, sour the cob, and discolor the grain. Sweet corn cut and shocked up like field corn will sour before it dries, unless the weather be both cool and dry enough before winter to escape injury by freezing. Corn left on the stalk untouched until the husk opens will be greatly discolored and injured by a spell of hot, damp weather. If, however, the ears be husked out on a dry day, and allowed to lie a few hours exposed to the direct rays of the sun, the organisms which cause fermentation are killed by the sunshine, and a layer of dried impervious matter is formed over the surface of the corn and the butt end of the cob, which makes it more difficult for fermentation to start in either corn or cob.

The writer's method of curing sweet corn for seed has been developed after many trials and vexatious failures from following other and more laborious methods, and is given with the confident knowledge that up to the present time it is the best method devised yet to save feed and fodder at the same time. Since adopting it there have been no failures. When the husk is dead and loose on the ear, the sooner the ear is removed and put under the shelter the better, for two or three days of rainy, not cloudy, weather may spoil it, even on the stalk. I pick out a bright clear day and commence early in the morning and cut down a small piece of the corn, throwing into piles, and then in the forenoon, when the sun is shining brightly, husk it out as rapidly as possible, throw the corn into small piles on the ground, tie the fodder in bundles, and set it up in small shocks. Then before night haul in the corn and put it on a slatted floor. The floor is made of lath 1 inch thick by 2 inches wide, spaced 1 inch apart. The corn is taken up in baskets, and each basket is turned upside down on the slats, and taken off carefully, so that the ears are left like a pile of "jack-straws," crossed in every direction, many of them standing in nearly a vertical position. Each basketful of corn is emptied in a fresh place, and when all is done the slats will be covered with corn about a foot deep, but so loosely arranged that there is no obstruction to the passage of air between the ears. In this position it dries very quickly and may be put into barrels as soon as all moisture is out of the cob. Each barrel may be covered with a piece of wire cloth held down by the top hoop, and then the barrel turned on its side.

If sweet-corn seed equal in quality to the New England product and heavier yielding can be successfully grown in Maryland, that fact has importance for States still farther south. Prevention from mixing, rigid selection each year, and great care in curing seem to be the essential factors to be observed.

KHERSON OATS.[a]

An important feature of the work of the experiment stations is the introduction of varieties of crops suited to given regions and special conditions, and many valuable additions have thus been made to the

[a] Compiled from Nebraska Sta. Bul. 82.

list of crops which the country is capable of producing. Much of this work is done by the stations in cooperation with this Department, but some is done independently. A notable recent example of valuable work of this character by an experiment station is the introduction of the so-called "Kherson oats" brought from Russia by Prof. F. W. Taylor, of the University of Nebraska, in 1896, and thoroughly tested by the Nebraska Station as to its adaptability to the corn belt of the United States.

"The climatic condition most favorable to the growth of oats does not usually obtain in the 'corn belt,' and it has been difficult to find a variety of oats well adapted to this region. It is a curious fact that although the great corn-producing States are the largest producers of oats, they are not States in which the yield per acre is high. An oat to produce well in Nebraska, and particularly in the central and western part, should be very early maturing, and should not run to straw." Such a variety was found in the Kherson Government in Russia, where the soil and climatic conditions (small and uncertain rainfall) are similar to those of the Great Plains.

FIG. 1.—Kherson oats.

The Kherson oat is a vigorous but not rank grower. The straw is very short; the leaves are broad and expose a large surface. The panicles are spreading, i. e., it is not a side oat (fig. 1). The berries are light yellow in color, small, but numerous, and have a very thin hull. It usually weighs well per bushel and matures very early.

The results of careful tests of the variety in different parts of Nebraska in 1901 to 1903 indicate that it is "peculiarly suited to central and western Nebraska on account of its habits of growth. * * *

"Although it usually yields well in eastern Nebraska, there are other varieties that in the river counties, at least, compare favorably with it. West of that the tests that have been made of it during the three years indicate that it is earlier, yields better, and weighs heavier than any other variety, with the possible exception of the Texas Red. It has steadily outyielded the Texas Red on the station farm.

* * * In the dry season of 1901 it showed remarkable drought-resisting qualities."

The Texas Red, though approaching the Kherson in yield, is objectionable from a market point of view on account of its color.

The indications are that in introducing the Kherson oats the Nebraska Station has rendered a great service to farmers of that large section of our western domain where the rainfall is too scanty or uncertain to insure good crops of ordinary varieties of oats.

COWPEA HAY.[a]

Well-cured cowpea hay is a most valuable dry forage, ranking much above the common grass hays in feeding value and being at least equal in this respect to good clover and alfalfa hay. With the area of wild grasses decreasing from year to year in certain localities, and the tame grasses in many cases failing to produce adequate yields, a heavy yielding crop with a short period of growth, like some varieties of cowpeas, becomes an important source of hay. The principal reason why the production of cowpea hay is not commensurate with its high value is the difficulty in curing the large succulent vines. Experiments in growing cowpeas as a hay crop and in handling the same economically and successfully during the curing process have been made at the Alabama, Arkansas, and Mississippi experiment stations among others, and the results obtained are here briefly restated in the hope that the information may be of assistance in bringing into practice more effective and less costly methods of curing, and a consequent increase in the production of this kind of hay.

The Alabama Station sought to facilitate curing and to avoid the loss of the leaflets, a most nutritious portion of the plant, which readily break from the vines in curing and handling, by growing cowpeas in a mixture with some grass crop. The principal difficulty here lies in obtaining varieties which arrive at the proper stage for haymaking at the same time with the grass. On good soils German millet grown with the Whip-poor-will cowpea proved useful in facilitating curing. The use of 1 peck of millet seed and 1 bushel of cowpeas per acre is recommended. If grown with a late variety the millet will be ready for cutting while the cowpeas are still too immature to cure well and to make good hay. A test was made of planting Wonderful cowpeas, a late variety, and drilling millet to within 6 inches of the cowpea rows seventeen days later, but still the millet ripened before the cowpeas were ready for haying. While the millet did not add to the yield of hay, Amber sorghum

[a] Compiled from Alabama Sta. Bul. 118; Arkansas Sta. Bul. 80; Mississippi Sta. Bul. 84; Pennsylvania State Dept. Agr. Rpt. 1903, p. 275.

drilled with Wonderful cowpeas on May 14 gave a material increase in the yield, and was ready for mowing at the same time as the cowpeas. The hay of the sorghum mixture was more moist than that obtained from the millet mixtures, and therefore is likely to present greater difficulties in curing; and this will be especially so in unfavorable weather. With these results as a basis, the station recommends growing German millet as an aid in curing early varieties of cowpeas and Amber sorghum as a means of increasing the yield with later varieties.

As long exposure to sunshine causes the leaflets to drop off, curing should be accomplished with the smallest proportion of the mown crop exposed to direct sunshine. Curing is mainly influenced by the weather and the succulence of the vines, and hence the time required for the process varies with these factors. Based on the experience in curing cowpea hay for several seasons, the station suggests the following general course of procedure: "Cutting one day and twenty-four hours later raking into windrows, where the hay may remain twenty-four hours; then cocking and, if practicable, leaving these cocks in the field for two or three days, at the end of which time they may be opened for a few hours before hauling, or hauled without opening, according to the condition of the hay." The use of canvas covers for the haycocks during wet weather was found to be very satisfactory and is believed to pay for itself in the end. An experiment in storing half-cured cowpea hay in a tightly packed condition proved unsuccessful.

From several hundred plats under field conditions the Arkansas Station obtained during five years an average of 3,169.4 pounds of hay per acre. In general, the results did not include the weight of either peas or hulls. In one of the seasons the highest average yield of hay per acre, 8,750 pounds, was obtained from the Clay cowpea, and the lowest, 750 pounds, from New Era and Extra Early Black Eye, the yield of shelled peas from the three varieties being 174, 1,337.5, and 1,025 pounds per acre, respectively. A plat of Wonderful cowpeas yielded 8,350 pounds of hay per acre, and two plats of Clay 8,250 and 7,450 pounds, with practically no pea production. These great varietal variations in the capacity of producing either hay or peas very forcibly calls attention to the advantage of selecting varieties suitable to the purpose for which the crop is grown.

The results in curing the crops on these plats ranged from perfect success to complete failure. Young or vigorously growing vines were difficult to cure even under favorable weather conditions, while mature vines cured with little difficulty in favorable weather and usually made good hay after an exposure of two to four days of rain and cloudiness. The varieties producing few or no peas were

most difficult to cure on account of their continued growth and succulent condition until checked by frost. Varieties producing the heaviest yields of peas were most easily cured into hay. Late shallow cultivation prolonged the period of growth, and in order to minimize the difficulties in curing it is suggested that if the crop is intended for hay no further cultivation be given after the first pods are formed. Vines bearing a fair or full crop of peas well ripening together were easily cured when about one-fourth of the peas were ripe and no second growth took place, while if the peas ripened through a prolonged period the plants continued in vigorous growth and were difficult to cure unless the weather was most favorable. Several varieties mown at different stages of growth to observe the effect of the degree of maturity on the curing of the vines for hay ripened their first pods as follows: Warren New Hybrid, August 15; Warren Extra Early, August 20; Whip-poor-will, August 28; Taylor, September 8, and Clay, September 14. The first mowing, made when the varieties were forming their first pods, proved unsuccessful for haymaking. The second mowing, made when the first pods ripened, gave good hay from Warren New Hybrid and Warren Extra Early. The first and second mowings of Clay and Taylor were failures, but good hay was produced from Taylor mown when half or all of the pods were ripe. The number of days from sowing until the first ripe pods appeared was as follows: Warren New Hybrid, 67; Warren Extra Early, 72; Whip-poor-will, 80; Taylor, 90, and Clay, 97 days. Clay is a late grower and did not prove to be a very successful variety for hay.

In another comparison vines of New Era, Black Eye, and Warren Extra Early, after ripening a full crop of peas, cured into good hay ready for storage in two days, and Brown Eye, California Black Eye, Large Black Eye, and Whip-poor-will, with a fair quantity of matured pods, also made very good hay; but several varieties in vigorous growth and with only occasional ripe pods when mown produced hay of very inferior quality.

Where cowpeas are grown between the rows of corn they are frequently harvested by pulling the vines by hand and throwing them into small cocks for curing. This method is applicable only on small farms, and the usual and most practical method of harvesting is with the mowing machine. Varieties of prostrate growth, however, are not very readily cut with the machine, and in growing cowpeas for hay the habit of growth must be taken into consideration and varieties more or less upright be selected in order to facilitate harvesting and curing. New Era, Whip-poor-will, and Wonderful are suggested as being well suited to harvesting with the mower.

Vines having ceased to grow and matured enough for hay may be

sufficiently cured for storing in thirty-six or forty-eight hours of favorable weather conditions, and if well cocked after lying a day will endure several days of rainy weather with but slight damage and cure into good hay. On the other hand, green and vigorously growing vines may not cure at all. The following directions for making cowpea hay are given:

The vines should be cut in the morning as soon as free from dew and when the indications are for favorable haymaking weather. The length of time the vines should remain in the swath depends upon the quantity of vine, degree of maturity, and the weather. A cloudless day, with high temperature, dry air, and high wind, will induce rapid curing, and with a combination of such conditions hay cut in the morning should usually be windrowed or cocked in the afternoon. As soon as the more exposed leaves are well cured, but not dry enough to crumble, the hay should be teddered or, in the absence of a tedder, raked into windrows. Having remained in windrows until the upper portion is well cured, the windrows may be rolled over, that the under portion may be exposed for a time. The hay is then thrown into cocks, where it remains until taken to the barn or stacked.

It is advisable to turn over the cocks a few hours before hauling, in order to expose them to the sun and to hasten curing.

Methods of curing cowpea hay around poles are also described. The vines when thoroughly wilted are stacked about poles 7 to 9 feet long, driven into the ground, and remain there until well cured. When longer and stronger poles are used crosspieces are nailed to them at right angles to each other, about 1 foot above ground and again several feet higher, and so on to the top of the pole. The green but wilted vines are placed about the poles and over the crosspieces to the top, where the stack is drawn to a point and capped. Curing is also accomplished by piling the vines around a simple framework of poles, leaving the stack hollow in the middle, and thus admitting a free circulation of air through the center. These methods of curing, however, involve much labor and expense and are not always practicable.

According to suggestions by Prof. W. F. Massey, of the North Carolina Experiment Station, cowpeas should be harvested for hay as soon as the first pods turn yellow, and the cutting should be done only in the morning under promising weather conditions. The vines should be tossed during the day by means of a tedder or by hand with a fork and raked into windrows that same evening. These are turned and dried the next day and cocked. After the cocks have stood for a day and no further moisture can be wrung from the hay by twisting a handful of it with considerable force it is ready for the barn; but if moisture still appears at the twist the cocks are turned over and rebuilt to hasten the curing and the time when the hay will stand the test.

The following methods of curing cowpea hay are given by W. R. Perkins, of the Mississippi Station:

The cutting is done when the crop is fully mature, which is about the time the pods begin to ripen and the foliage begins to change color.

The mowing-machine blade is kept sharp and run as close to the ground as possible. If the peas are in rows the cutting can be done much cleaner and better with a very sharp hoe and at very little additional cost.

If the weather is good, as is usually the case when the crop is ready, August or September generally, the vines are raked up the same or the following day and put into cocks of the size that two men can handle with a fork when cured. They are left in the cocks for four or five days, being turned over once or twice during the time, then hauled to the barn or stack. In case they are put in a stack a good covering of grass hay is necessary in order to shed the water. The sides of the stack should be built straight up to prevent the water spoiling the outside hay.

Putting in cock is desirable because the hay is then cured by the circulation of air through it, and not in the direct sunlight. Any hay is better when cured in the shade.

If the weather is damp or rainy the hay is not raked at all till cured, when it is carried directly to the place where it is to be stored. If it continues to rain for several days after cutting, do not touch the hay till ready to put up, and then be sure that it is dry when packed away. This is a precaution that must be observed in storing any kind of hay—do not put up when even moist with dew or it will mold.

The crop may sometimes be lost in a protracted wet spell, but can generally be saved in such condition as to make very good forage.

Methods of putting up green are practiced and are entirely satisfactory when the vines are so packed that air can circulate freely through them.

One of the methods of putting up green is to erect a stack pole and nail a strong crosspiece on the pole extending to the outer edges of the stack. Put on a layer of the green vines 2 or 3 feet thick, then nail on another crosspiece, and so on to top of stack, finishing off with grass hay. The crosspieces prevent the vines packing down closely and at the same time allow the air to enter the stack. Hay can be cured and kept by this method. It is somewhat more expensive than curing in the field, as it necessitates the handling of a great amount of water in the green vines, and the cost of stack pole, crosspieces, etc., amounts to something.

WEIGHT PER QUART OF FEEDING STUFFS.[a]

The quart is the measure generally used on the farm, and especially in connection with measuring the rations of concentrated feeds for farm animals. Since such rations can be more accurately stated in terms of actual weight and are always so stated in the more scientific discussions of the subject, it is important to know the weight per quart of the feeds most commonly used. The following table of such

[a] Compiled from Connecticut State Sta. Bul. 147; Massachusetts Sta. Bul. 101.

weights is given in a recent bulletin of the Massachusetts Experiment Station. This table was prepared by weighing a carefully measured quantity of the several feeds.

Average weights of different feeding stuffs.

Feeding stuff.	One quart weighs—	One pound measures—
	Pounds.	*Quarts.*
Barley meal	1.1	0.9
Barley, whole	1.5	.7
Brewers' dried grains	.6	1.7
Corn-and-cob meal	1.4	.7
Corn-and-oat feed	.7	1.4
Corn bran	.5	2.0
Corn meal	1.5	.7
Corn, whole	1.7	.6
Cotton-seed meal	1.5	.7
Distillers' dried grains	0.5–.7	1.0–1.4
Germ oil meal	1.4	.7
Gluten feed	1.3	.8
Gluten meal	1.7	.6
Hominy meal	1.1	.9
Linseed meal, new process	.9	1.1
Linseed meal, old process	1.1	.9
Malt sprouts	.6	1.7
Mixed feed (bran and middlings)	.6	1.7
Oat feed (a variable mixture)	.8	1.3
Oat middlings	1.5	.7
Oats, ground	.7	1.4
Oats, whole	1.0	1.0
Rye feed (a mixture of rye bran and rye middlings)	1.3	.8
Rye meal	1.5	.7
Rye, whole	1.7	.6
Wheat bran	.5	2.0
Wheat, ground	1.7	.6
Wheat middlings (flour)	1.2	.8
Wheat middlings (standard)	.8	1.3
Wheat, whole	1.9	.5

A bulletin of the Connecticut State Station gives in addition to the above—mixed wheat feed, 0.6 pound per quart; provender, 1.5 pounds; rye bran, 0.6 pound.

SUGGESTIONS REGARDING GRAIN RATIONS.[a]

In a recent bulletin of the Massachusetts Agricultural Experiment Station, J. B. Lindsey makes the following practical suggestions regarding grain rations:

Concentrated feeds differ from roughage in two important particulars: First, all concentrates contain more true starch and less woody fiber, and consequently are more digestible; secondly, most of them contain more protein. The object, therefore, of feeding concentrates is to increase both the total digestible matter and the amount of protein in the daily ration.

It is better to use two or three grains in making a ration than to feed one concentrate exclusively, and the feeder should aim to prepare palatable grain mixtures. Rations should be bulky, to avoid digestive disturbances. Many feeders use from one-third to one-half wheat bran in order to obtain the necessary bulk. Distillers and brewers' dried grains and malt sprouts likewise serve as economical bulky feeds. It is also possible to use corn silage and chopped hay as diluters or distributers of the heavy concentrates.

[a] Compiled from Massachusetts Sta. Bul. 101.

If bran is used as a base, a very good type of ration may consist, by weight, of:

(1) ⅓ bran, ½ gluten feed, and ⅙ cotton-seed meal.

(2) ⅓ bran, ⅓ cotton-seed meal, and ⅓ corn meal.

(3) ⅓ bran, ⅓ gluten meal, ⅓ flour middlings.

(4) ½ bran, ½ gluten feed.

One may use dried distillers' grains for bulk and also as a source of protein, mixing by weight:

(1) ½ distillers' grains, ¼ flour middlings, ¼ corn meal.

(2) ½ distillers' grains, ⅙ cotton-seed meal, and ⅓ corn meal.

Malt sprouts, also a bulky feed, can be used, mixed with other grains, by weight, as follows:

(1) ¼ malt sprouts, ¼ mixed feed, ½ gluten feed.

(2) ⅓ malt sprouts, ⅔ corn meal, ⅔ gluten feed.

It is better to prepare a considerable amount of the above mixtures at one time, and then feed a definite quantity each day.

In case corn silage is used as a distributer, the mixture may consist, by weight, of:

(1) ⅓ cotton-seed meal, ⅓ flour middlings, and ⅓ corn meal.

(2) ½ corn meal, ¼ cotton-seed meal, and ¼ oat middlings or rye feed.

Care must be taken to see that such combinations are well mixed with the silage.

Seven pounds is the usual quantity to be fed daily to cows producing 10 to 12 quarts of milk. The richer the milk the more food needed. Because of the high prices of concentrates, and in localities where there is not a quick demand for milk, many feeders may find it economy to use but 5 pounds of grain daily, and feed maximum amounts of roughage. Heavy milking Holsteins generally require from 10 to 14 pounds of grain daily, depending upon the milk yield.

It is hardly possible to advise dairymen which ration would prove the most economical, as prices are likely to change so quickly.

Only general suggestions can safely be made, and these must be supplemented in any case by a study of the markets and the exercise of good judgment on the part of the practical feeder in order to get the most economical as well as effective ration.

RECENT HORSE-FEEDING TESTS.[a]

A ration of oats and hay of good quality is generally recognized as a standard in horse feeding and is considered by many feeders indispensable for fancy stock if the best results are to be secured. Nevertheless, in different regions a variety of feeding stuffs are used for horse feeding, and it is true, especially for work animals, that the character of the ration fed is very largely determined by the local food supply. In recent years a number of the experiment stations have carried on investigations which have to do with the value of different feeding stuffs for horses and the ways in which they may be best combined to secure a high degree of efficiency at a reasonable cost,

[a] Compiled from Florida Sta. Bul. 72; Indiana Sta. Bul. 97; Massachusetts Sta. Bul. 99; North Carolina Sta. Bul. 189; Canada Expt. Farms Rpt. 1902, p. 61.

and a popular summary of such work has been published by this Department.[a] Some additional investigations along the same lines are also of interest.

C. W. Burkett, at the North Carolina Experiment Station, made an extended series of studies with farm horses and mules, for the purpose of comparing local-grown feeding stuffs with each other and with purchased feeds, the tests being, in general, so arranged that the rations compared were fed at the same time to each of a pair of animals performing like work under uniform conditions. The principal feeding stuffs studied were bran, cowpea hay, gluten meal, corn-and-cob meal, shelled corn, corn silage and stover, cowpeas, cotton-seed meal, animal meal, and blood meal, a total of 59 rations being tested. During the tests the weights of the animals were taken weekly and the number of work hours recorded. The conclusion was reached that the home-grown forage crops under consideration are adapted to horse feeding, and by their use the purchase of feeds may be reduced to a minimum. Cowpea hay is considered a valuable feed for horses. Combined with corn-and-cob meal it makes a satisfactory working ration and can also be substituted for bran and oats, provided a reasonable quantity of corn is also fed. Two mules weighing about 1,000 pounds each maintained their weight for a period covering about two months on a ration of 10 pounds of cowpea hay, 1.5 pounds of cotton-seed meal, and 15 pounds of corn-and-cob meal, the average cost per day being 19.5 cents.

Corn silage proved a superior feed for horses and mules, one of the most satisfactory rations in the series of tests being made up of 21 pounds of silage, 15 pounds of corn, 2 pounds of bran, and 1 pound of cotton-seed meal. Corn stover was also shown to be an exceedingly valuable feed for farm horses and mules, and the author considers it a good substitute for hay in winter on account of its feeding qualities, high yield per acre, and low market value. Oat hay, cut while in the milk stage, was also found to be a satisfactory feed. When thus harvested it compared favorably with clover hay and cowpea hay.

Considering the nutrients supplied per pound, cotton-seed meal was found to be a relatively cheap feed, and its utilization is spoken of as a matter of great importance, especially for southern farmers. In the North Carolina experiments cotton-seed meal formed a part of the ration in a number of cases, in general with good results, though some of the animals did not at first relish it. The author states that "2 pounds of cotton-seed meal, as a part of the daily rations, was fed to horses and mules with satisfaction. This quantity can be fed either in a mixture with grain or sprinkled on silage

[a] U. S. Dept. Agr., Farmers' Bul. 170.

or on hay or stover that has been moistened previous to feeding. In comparison with other feeding stuffs, cotton-seed meal, because of its high feeding value, is a relatively cheap feed. Corn stover, corn, and cotton-seed meal, because of feeding and commercial values, make satisfactory rations for winter feeding of horses and mules, or at other times when on light or moderate work."

In some of the tests tankage and dried blood were fed, the results as a whole being satisfactory. The dried blood is regarded as especially valuable where horses are run down or thin in flesh. In the case of tankage 1 or 2 pounds was fed per day and in the case of dried blood 1 pound.

As regards the comparative value of different cereal grains and by-products, bran was found to be an acceptable and satisfactory substitute for oats and corn, and in the author's opinion it should always find a place in the ration of work horses where it can be obtained at a moderate cost. The animals fed corn-and-cob meal showed the same efficiency in work and maintained their weight as well as those fed an equal quantity of shelled corn.

When corn on the ear was compared with an equal quantity of corn-and-cob meal, corn stover being used as a coarse fodder, the results were in favor of the ground grain. When clover was used as a coarse fodder there was practically no difference in the two rations. In general it appears that the advisability of grinding corn will depend upon the cost of labor and trouble involved in the operation.

When wheat and cowpeas were compared as part of a ration the cowpeas were considered equal to the wheat or possibly somewhat superior, and, in the author's opinion, are a satisfactory substitute for oats in feeding farm horses and mules. In a test in which cowpeas and oats were compared 4 pounds of each of these feeds was added to a basal ration of 4 pounds of ground wheat, 4 pounds of corn-and-cob meal, and 14 pounds of meadow hay, the cost of the oat ration being 24.4 cents and of the cowpea ration 20.4 cents. In the two weeks of the test the horses had each gained a little in weight and, judged by their appearance and condition, the two rations were equally satisfactory.

From his work as a whole the author concludes that "various kinds of feeding stuffs can be used to advantage and with economy in feeding farm horses and mules. There is no so-called 'one ration for horses.' A mixture of corn and bran, or of corn and cowpeas, or of corn, bran, and cotton-seed meal, is a good substitute for corn and oats in feeding work animals. Any feeding stuff or combination of feeding stuffs that furnishes the necessary and desirable nutrients at least cost should be the important consideration in the preparation of rations for farm horses and mules."

At the Indiana Station, C. S. Plumb compared a brand of dried distillers' grains with oats as a feed for horses. Marked differences were noted in the quantity of the distillers' grains eaten, in one of the tests the average amount being about 7 pounds per head per week with one pair of animals as compared with about 32 pounds per head with another pair. The amount of oats eaten ranged from about 76 to 94 pounds per head per week. It was always found necessary to accustom the horses to the distillers' grains by adding them in increasing amounts to the oat ration. In a second test much the same differences were observed in the amounts of distillers' grains eaten, this feed being so little relished that the quantity consumed by the horses would not have sufficed for the performance of their ordinary work unless other and more palatable feeds had been supplied. In brief, the conclusion was reached that the distillers' grains tested are not palatable horse feed, although judged by their chemical composition they possess a high feeding value. The investigation "simply illustrates the special importance of palatability as a factor in the adoption of food stuffs for use in common practice."

The use of sweet potatoes, cassava, and cane sirup as partial substitutes for corn in a ration for horses and mules was studied by C. M. Conner at the Florida Experiment Station. In the test with sweet potatoes two pairs of horses and two of mules, doing hard work, were used, one animal of each pair being fed approximately 6 pounds of corn, 17 pounds of hay, and 15 pounds of sweet potatoes per 1,000 pounds live weight, and the other some 10 pounds of corn and 15 pounds of hay per 1,000 pounds live weight, the hay used being beggar weed of good quality. After about six weeks the rations were reversed. Little variation in the weight of the animals was observed, except that in some cases there was a gain when sweet potatoes were fed. The sweet-potato ration was cheaper.

The most important fact brought out in this experiment is that sweet potatoes may be substituted for at least one-half of the corn ration, this substitution being at the rate of 3 pounds of sweet potatoes for 1 of corn. This being the case, an acre of sweet potatoes yielding 150 bushels is equal to a yield of 50 bushels of corn, so far as feeding the work stock is concerned. We do not think that a horse at hard work would do well on an all sweet-potato ration, from the fact that the bulk would be too great for the capacity of the stomach. * * * We have fed one mule for three months on sweet potatoes, cassava, and hay, with good results. He was used for light work about the lot, such as hauling feed, bedding, etc.

Using one pair each of the mules and horses included in the previous test, the value of cassava was studied, one animal of each pair being fed cassava with corn and beggar-weed hay for six weeks, and the others corn and hay. The average amount of cassava eaten was irregular and in general smaller than in the case of sweet potatoes.

"The animals maintained their weights throughout the experiment, which may go to show that cassava is more concentrated than the sweet potatoes. * * * Cassava may be used in about the same ratio as sweet potatoes, but is not so palatable to the animal."

At the close of the cassava test one of the mules was fed for six weeks a ration of corn and low-grade cane sirup and another the regular corn ration. The amount of hay eaten per head was about the same as in the previous tests. Small gains were made on both rations. "Both mules remained in good condition during this experiment in spite of the fact that they were doing hard plowing throughout the entire time." Other tests made at the station show that sirup is relished by all farm animals, and may be fed to work stock "provided it is mixed with chopped hay or something to give it bulk." As regards the use of native hay for draft horses and mules, it is not believed that the local prejudice sometimes expressed is justified. It has been fed exclusively to horses and mules for two years without any unsatisfactory results.

In discussing southern-grown feeding stuffs for horses it is interesting to note that sugar cane is considered a valuable fodder for horses in Africa,[a] though apparently its value for this purpose has not been reported on by the experiment stations in the United States.

W. Godchaux[b] in a discussion of the rational feeding of plantation mules gives data regarding the present system of feeding at a large sugar factory at Assumption Parish, Louisiana, as compared with that previously followed. The ration at present used consists of 8 pounds of corn-and-cob meal, 2 pounds of cotton-seed meal, 11 pounds of molasses, and 15 pounds of pea-vine hay per head, the cost being 14.5 cents. It is estimated that this would supply the nutrients and energy needed for horses and mules at heavy work as shown by Wolff's standard. It is stated that the use of this ration has diminished the cost of feeding mules nearly one-half, while at the same time their health has improved. It is interesting to note the liberal use of molasses and cotton seed in this ration.

A summary of data on horse feeding was recently made by J. B. Lindsey and P. H. Smith at the Massachusetts Station, such topics as suitable feeds (including molasses, among others) for horses, preparation of feeds, digestibility of rations, and watering horses being discussed. A number of rations were suggested, some of which have been tested at different experiment stations or by practical feeders.

Generally speaking, 12 to 15 pounds each of hay and grain daily are sufficient for horses of 1,200 to 1,300 pounds weight doing moderately hard work. Should a portion of the grain consist of cotton seed or gluten meal, it would be

[a] Natal Agr. Jour. and Min. Rec., 6 (1905), p. 539.

[b] Proc. Louisiana State Agr. Soc. and Stockbreeders' Assoc., 1904, p. 71.

wise to reduce the grain ration somewhat and increase the quantity of hay. Farmers will naturally prefer to feed a maximum amount of hay and as small a quantity of grain as possible. In view of the high prices usually prevailing for oats the feeder should aim to provide partial or entire substitutes for this grain. Mixtures of corn and bran, or corn, brewers' grains, and bran ought to prove quite satisfactory.

At the Canada Central Experimental Farm, J. H. Grisdale and his associates recorded data regarding the cost of feeding horses, and it was found that the average cost of feed per day was 27.33 cents, and the cost of care 8 cents additional. In a test of the relative value of mixed grains fed with chopped hay, three horses fed 18 pounds of equal parts of ground oats and barley gained 70 pounds in ninety-one days; three fed about the same amount of ground oats and barley 2 to 1 gained 52 pounds, and seven fed 17 pounds of ground oats gained on an average 83 pounds each. All the horses continued in good health throughout the test, and, so far as could be judged, one of the rations was as good as another.

The condition in which the horses are marketed has a decided effect upon their selling price, and it is a common practice to feed them for a longer or shorter period before marketing with a view to inducing gains in weight. W. J. Kennedy,[a] of the Iowa Station, in a discussion of this question points out that a full grain ration with an abundance of forage is needed, and notes that many find clover a satisfactory coarse fodder and corn, oats, and bran a good grain mixture. Cooked or steamed grain twice a week is recommended, with some oil meal or flaxseed added, and glauber salts once a week is said to be useful, especially as the horses are given little or no exercise. Feeding three or four times a day is recommended. Horses on full feed, it is stated, should gain from 3 to 5 pounds per day.

E. A. A. Grange[b] found molasses of value for bringing a horse into condition. He fed 3 quarts of molasses mixed with 6 pounds of finely chopped hay three times a day. At the end of two months the horse had made a gain of 90 pounds.

MARKET CLASSES AND GRADES OF SWINE.[c]

William Dietrich, of the Illinois Station, states that "in selling hogs to the local buyer or shipper the farmer is very often at a decided disadvantage because he can not interpret market reports to the full extent of their meaning, and therefore either does not get what his hogs are worth or loses a sale by asking too much for them." Believing that a better understanding of the market side of

[a] Wallaces' Farmer, 28 (1903), p. 1363.

[b] Breeders' Gaz., 43 (1903), No. 24, p. 1173.

[c] Compiled from Illinois Sta. Bul. 97.

the business would be of benefit to the average farmer who has not had opportunity to familiarize himself with market terms and usages, he attempts to explain how swine are classified and graded on the Chicago and other markets.

The following is given as the classification used on the principal markets:

Market classification of swine.

Classes.	Subclasses.	Grades.
Prime heavy hogs, 350 to 500 pounds		Prime.
Butcher hogs, 180 to 350 pounds.	Heavy butchers, 280 to 350 pounds	Prime. Good.
	Medium butchers, 220 to 280 pounds Light butchers, 180 to 220 pounds	Prime. Good. Common.
Packing hogs, 200 to 500 pounds.	Heavy packing, 300 to 500 pounds Medium packing, 250 to 300 pounds Mixed packing, 200 to 280 pounds	Good. Common. Inferior.
Light hogs, 125 to 220 pounds.	Bacon—English, 160 to 220 pounds	Choice. Light. Fat.
	Bacon—United States, 155 to 195 pounds	Choice. Good. Common.
	Light mixed, 150 to 220 pounds	Good. Common. Inferior.
	Light light, 125 to 150 pounds	Good. Common. Inferior.
Pigs, 60 to 125 pounds		Choice. Good. Common.
Roughs.		
Stags.		
Boars.		
Miscellaneous:		
Roasting pigs, 15 to 30 pounds.		
Feeders.		
Governments.		
Pen holders.		
Dead hogs.		

Mr. Dietrich describes these various classes, with numerous illustrations, substantially as follows:

Prime heavy hogs.—These include prime, heavy, fat-back hogs representing the extreme of the fat or lard hog type. "With the tendencies of the market working toward the lighter hogs, there are not very many of these heavy hogs at present coming to market; however, there are still enough to make a market class."

Butcher hogs.—These are commonly used for the fresh-meat trade and constitute about 25 per cent of the hogs coming into the Chicago market. Butcher hogs as a class are principally barrows, and range in age from six months for light butchers to one year for heavy butchers. "Other things being equal, barrows sell more readily and at better prices than do sows. In a drove of butcher hogs there may be present a few good sows without detracting from the value of the drove."

"Hogs that will grade as *prime butchers*, either heavy, medium, or light, must be perfect in quality, ideal in form, and must show much evidence of ripeness in condition as well as maturity."

Good butchers, though not equal to prime butchers, are still very good representatives of highly developed hogs. "Compared with prime butchers, the good butchers may be slightly deficient in form, or a little lacking in quality or maturity, or may be lacking somewhat in condition."

Common butchers are found only in the medium and light butcher classes. "The common butcher hog is one that shows considerable evidence of having been well fed, and possesses compactness, smoothness, and firmness. Frequently, however, he is not a mature animal, and is considerably more deficient in form, quality, and condition than the prime butcher hog."

Packing hogs are as a class of a poorer grade than the butcher hogs, and include old brood sows and all other hogs which are heavy enough for this class and not good enough for the butcher-hog class, except the very poor classes, such as roughs, boars, and coarse stags. "The side pork from these hogs is used principally in the various processes of curing. It is made into mess pork, short-cut mess pork, dry salt sides, and the hams and shoulders are cured. About 40 per cent of the hogs coming to the Chicago market annually are of this class. They range in age upward of about nine months."

Heavy packing subclass includes the heavy hogs and *medium packing* the lighter hogs of this class. *Mixed packing* is a subclass representative of hogs as they come to the yards from local buyers in the

country, including hogs of different classes as well as different grades and weight, as the name indicates.

Light hogs.—This class includes all hogs within the weight limits 125–220 pounds, except roughs, stags, and boars, which form separate classes. "About 15 per cent of all the hogs coming to the Chicago market are of this class. They range in age from five to eight months. Since this class includes practically all hogs within the given weight limits, they must necessarily be quite different as to form, quality, and condition. Such being the case, the meat from the same is prepared differently, thus making the subclasses of more importance than in the two former classes."

Breakfast bacon, as is well known, is cut from the side of a hog, and is prepared by salting the pork and then smoking. In some cases the hams and shoulders are sold separately, although much of the English bacon is cut into what is called a "Wiltshire side," i. e., the whole side, with simply the head and feet cut off. Many of the hogs sold in the Chicago and other markets of the United States for bacon purposes are not of the ideal bacon type. The *bacon hog* must be "long in body, deep in side, with comparatively narrow back, narrow and light hams and shoulders, and light, muscular neck.

This form is desirable because it is the side of the hog that furnishes the best and most expensive cuts, and it is necessary to have as much as possible of this at the expense of the other parts. This hog must also show indications of having firm flesh, be well covered with lean meat or muscle, and must not have an excess of fat on the outside of the carcass. The fat on the outside should not be more than 1 to 1¼ inches in thickness, and should be evenly distributed over the entire carcass. The weight must be between 160 and 220 pounds, as this makes the most desirable cuts as to size, flavor, and firmness. From the very nature of a cut of bacon, size is of much importance. A hog smaller than the given weight would furnish a side of bacon that would be too thin, and one larger than this would furnish one that would be too thick.

A hog old enough, that with good care and breeding will weigh from 160 to 220 pounds, furnishes bacon that is of the best flavor. A hog smaller than this would very likely be too young, and one heavier than this would be too old to furnish bacon of the best flavor. In firmness of flesh, also, the 160 to 220 pound bacon hog is likely to be most desirable. A hog younger than is required to produce this size would have too much water in its flesh; for the younger the animal, the more water it has incorporated in its system, and this excess of water in the system of the young hog not only detracts from the firmness of the flesh, but also replaces much of the food value, thus forming a meat that has less "substance." When a hog is heavier than 220 pounds, he is not so good for bacon purposes, because when beyond the age required to produce this weight there is a greater tendency to lay on fat, not only on the outside of the carcass, but also to intermix more fat with the lean meat, thus producing too much fat in proportion to lean meat for the best bacon. After this age there is also more of a tendency to lay on fat unevenly and in patches, and where this occurs it is impossible to produce good bacon. * * *

By the term choice, in reference to a bacon hog, is meant one that conforms as nearly as possible to the above description. It must have the form that is characteristic of this type of hog, and must have the best quality and condition that is desired for the bacon trade. * * *

To be in good condition a bacon hog must have a good development of lean meat or muscle, with the proper amount of fat as outlined above. He must be smooth, well developed, and have a large proportion of edible meat, while the proportion of fat and other offal must be small. Hams, shoulders, jowls, and neck must also be small in proportion to length and depth of side. If a hog has all these characteristics of form, quality, and condition developed to a marked degree, it would be considered a choice bacon hog. * * *

It may be thought that the production of bacon is possible only with certain breeds of swine and that these breeds will always produce bacon under all circumstances. While this is true in a general way, it is not always true. It is the feed and mode of life that produces the bacon hog and that enables him to retain his form as such after he has been developed.

The bacon-hog type of the United States differs considerably from the English bacon hog, which has recently been introduced into the United States and is rapidly establishing for itself a market class. There is, however, a growing tendency toward the typical bacon type.

There is a demand on the markets of this country from foreign countries, and more largely from our own country, for bacon, and there being few bacon hogs to supply the demand, the trade is supplied from the lighter hogs of the fat or lard hog type. This bacon, however, does not command so high a price on the market as does bacon from typical bacon hogs. The bacon hogs under consideration here weigh from 155 to 195 pounds, and range in age from 6 to 8 months. They are simply hogs selected from the light hogs in general that conform as nearly as possible to the bacon type. They are not very fat, have fairly good development of muscle or lean meat, and are as long and deep inside as is possible to obtain them. About 20 per cent of the light hogs that come to the Chicago market are of this type.

About 55 per cent of the light hogs coming to the Chicago market are said to be of the *light mixed* class, a somewhat miscellaneous class, quite similar, except as to weight, to mixed packing hogs, and containing hogs of the light butcher weights that are too poor in quality, form, and condition for butcher hogs, as well as hogs of the same weight as the bacon hogs, but which are too much of the fat or lard type hog for bacon. "This class, then, is the 'dumping ground' for the outcasts of two former classes of hogs. In one case it takes the poorer hogs and in the other case the better hogs, considered from the fat or lard hog standpoint. * * * Hogs of this class are used principally for the fresh-meat trade. * * * They range in age from 5 to 7 months."

It is stated that about 25 per cent of the light hogs coming to the Chicago market are of the *light light* class, which includes hogs rang-

ing in age from 5 to 6 months, and are, as the name indicates, the lightest of light hogs. "While the 'light butchers' and 'bacon hogs' are the selected kinds of their respective weight, with consequent small variation between the different grades, the class of 'light light hogs' includes all the hogs of this weight, consequently the range in the grades is wider. They are used principally for the fresh-meat trade."

Pigs.—Pigs, as found on the market, range in weight from 60 to 125 pounds, and in age from 3½ to 6 months. This class, like that of light light hogs, includes all the pigs that range within the given weights. "They are used principally to supply the demand from the cheaper restaurants and lunch counters, and are in greatest demand in winter, being hard to preserve fresh in summer and too young to cure. About 10 per cent of the hogs coming to the Chicago market are of this class."

Roughs.—This class includes hogs of all sizes that are coarse, rough, and lacking in condition—too inferior to be classed as packing hogs or as light mixed hogs. "The pork from these hogs is used for the cheaper class of trade for both packing and fresh meat purposes. In market reports pigs and roughs are frequently classed together, not because they belong in the same class, but because they sell at approximately the same price. * * *"

Stags.—"Stags are hogs that at one time were boars beyond the pig stage and have been subsequently castrated. They sell with a dockage of 80 pounds. If they are of good quality and condition and do not show too much staginess they go in with the various grades of packing hogs. When they are coarse and staggy in appearance they are sold in the same class with boars. The intermediary grades sell for prices ranging between these extremes, dependent upon their freedom from staginess and their quality and condition."

Boars.—"Boars are always sold in a class by themselves and bring from $2 to $3 per hundredweight less than the best hogs on the market at the same time. They always sell straight, with no dockage. There are no distinction as to grades; they simply sell as boars. Of course, if there are marked differences as to quality and condition, the price varies a little accordingly. The pork from these animals is used to supply the cheaper class of trade, and also for making sausage."

Miscellaneous.—*Roasting pigs* are not generally quoted in market reports. They come to market in small numbers and only during holiday seasons, and their price varies greatly.

Feeders are hogs bought on the market and taken back to the country to be further fed, a practice which is followed only to a very limited extent.

Governments are hogs rejected by the Government inspector as not

sound in every respect. "They are usually bought up by a local dealer and taken to one of the smaller packing houses, where they are slaughtered under the supervision of an inspector. If found to be affected so as to make their flesh unfit for human food they are condemned, slaughtered, and tanked. The tank is a large, steam-tight receptacle, like a steam boiler, in which the lard is rendered under steam pressure. This high degree of heat destroys all disease germs with which the diseased carcass may have been affected. The product of the tank is converted into grease and fertilizer."

"The commission men who sell the stock as it comes to the yards, and the speculators who handle part of it, pay nothing for their privilege of doing business in the yards. They hold their respective positions by common consent and their respective pens by keeping hogs in them." These hogs are called *pen holders*, and have no influence on the market.

Dead hogs are those killed in the cars in transit, and are used for the manufacture of grease, soap, and fertilizer. "If they weigh 100 pounds or over they sell for 75 cents per hundredweight. If they weigh less they furnish no revenue to the producer or shipper, the cost of handling the same being held equal to their value."

About two-fifths of the world's hog supply is produced in the United States, and about six-sevenths of these are produced in the Mississippi Valley; hence this section of country has developed the fat or lard hog and has set the standard for hogs in other parts of the United States. * * *

The fat or lard hog is such because corn has been his principal feed and because there has been a demand for pork from such a hog, and he will conform to the present prevailing type just as long as corn remains his principal feed. * * *

Butcher hogs are the best hogs from the fat or lard hog standpoint that come to market, and should be used as a standard for comparison.

From the bacon market standpoint the English bacon hog is the ideal toward which hogs are being developed.

To the close observer it is apparent that the gradually changing conditions brought about by the development of the United States, and the increase in the price of corn resulting from its varied commercial uses, cause the hog to be fed a more mixed and usually a more nitrogenous ration. This will in the future affect the type of the hog of the United States, so that it will more nearly approach that of the English bacon hog.

An obvious deduction from the bulletin is the advantage of uniformity in the lots of hogs shipped to large markets, which conform to recognized classes. The chief purpose of the bulletin is to explain the system of grading or classifying hogs, in order that the farmer may understand the market side of the business more thoroughly and be better able to interpret the market reports. This classification is necessarily somewhat flexible in its application, depending upon individual judgment; and hence there is greater opportunity for

difference of opinion in the case of an uneven lot of hogs. In the higher grades especially uniformity is quite desirable, and a few inferior animals may bring down the price of the whole lot, as they injure its appearance. As Mr. Dietrich points out, this lack of uniformity and the lack of condition is responsible for certain "mixed" classes which are made the dumping ground for the outcasts of the higher grades. Such mixed lots sell at a disadvantage. Speculators take advantage of this, buying several carloads, which they sort into various classes and resell at a profit because they are properly graded.

SILAGE IN PLACE OF GRAIN FOR DAIRY COWS.[a]

In a recent bulletin of the Ohio Station C. G. Williams says: "The prevailing high prices of grain feeds in the face of very moderate prices for dairy products have reduced the dairyman's profit to a point where it is a question with him whether he can make the cow pay for the large grain ration he has been accustomed to feed. If he can dispense with half the grain he has been feeding without materially reducing his production of milk and butter fat, his chances for profit have increased."

During the winter and spring of 1904 the Ohio Station conducted an experiment with ten dairy cows, representing five different breeds, "to determine what effect the feeding of more silage than is usually fed by dairymen, with a corresponding reduction in the grain portion of the ration, might have upon the production of milk, butter fat, gain in live weight, cost of the ration, and consequent profit. * * *

"The general plan of the experiment was to compare two rations which should carry as nearly as possible the same amount of dry matter and nutrients. In one ration these nutrients were to be derived largely from roughage, mainly silage; in the other ration no silage was to be fed and as little roughage as seemed wise, the bulk of the nutrients being derived from concentrates." The two rations fed carried practically the same amount of dry matter. In one over 50 per cent of this dry matter was derived from silage and less than 18 per cent was derived from grain. In the other over 57 per cent of the dry matter was derived from grain, no silage being fed.

"The silage used in this test was a mixture of 1 ton of soy beans and cowpeas to 2½ tons of silage corn. There were nearly twice as many soy beans in the mixture as cowpeas. The silage corn was very low in dry matter, owing to an unfavorable season." The silage as fed contained 18.63 per cent of dry matter, 2.36 per cent of protein, 4.68 per cent of crude fiber, 0.92 per cent of fat, and 9.36 per cent of

[a] Compiled from Ohio Sta. Bul. 155.

nitrogen-free extract, being richer in protein and poorer in carbohydrates than average corn silage on account of the admixture of soy beans and cowpeas.

The figures used in estimating the cost of the different rations were as follows: Silage 10 cents per hundredweight, hay 30 cents, stover 20 cents, wheat bran 93.7 cents, corn meal $1, oil meal $1.16¼, butter 25½ cents per pound, and skim milk 15 cents per hundredweight.

The value placed upon a ton of silage is based upon that of the corn and stover grown upon similar ground and marketed as such. For instance, upon ground on which we average 50 bushels of shelled corn per acre we grow 15 tons or better of silage corn. The 15 tons of silage corn, therefore, may be said to be worth the market value of the 50 bushels of corn plus the 1¼ tons of stover which will go with it. (We find the expense of putting an acre of corn into the silo to be practically the same as shocking, husking, and cribbing the grain and hauling off the stover.) We have here charged 51 cents per bushel for corn on the average for the period covered by the test and $4 per ton for stover. This will make the acre of silage corn worth $30.50, or $2.03 per ton.

The price credited for butter fat is based upon the wholesale price of Elgin butter, as quoted in current publications. The customary one-sixth is added to the fat for the butter equivalent. * * * Eighty per cent of the total milk yield is assumed to be returned as skim milk.

The cows fed the silage ration produced 96.7 pounds of milk and 5.08 pounds of butter fat per hundred pounds of dry matter; those fed the grain ration produced 81.3 pounds of milk and 3.9 pounds of butter fat.

The cost of feed per hundred pounds of milk was $0.687 with the silage ration and $1.055 with the grain ration. The cost of feed per pound of butter fat was 13.1 cents with the silage ration and 22.1 cents with the grain ration. The average net profit per cow per month (over cost of feed) was $5.864 with the silage ration and $2.465 with the grain ration.

Comparing the average daily product of each cow for the entire test with her average daily product for the month previous to the change in ration (or the first month of their test in the case of two cows), the cows fed the silage ration shrank 2.84 per cent in milk and gained 1.89 per cent in butter-fat production. The cows fed the grain ration shrank 9.11 per cent in milk and 14.18 in butter-fat production. Upon the conclusion of the experiment each lot of cows was found to have gained in live weight—the silage-fed cows an average of 47 pounds per head; the grain-fed cows an average of 57 pounds per head.

The facts reported seem to justify the conclusion that silage can be made to take the place of a considerable portion of the grain ration. It is believed that by growing more of the feeds rich in protein—clover, alfalfa, soy beans, cowpeas, field peas, vetches—and ensiling them, or feeding them as hay, it will be possible to further reduce the amount of grain fed.

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